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PATENT APPLICATION
PO-7652
LeA 35,689

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION OF)
TORSTEN HAGEN ET AL) GROUP NO.: 1711
SERIAL NUMBER: 10/606,399) EXAMINER: R. SERGENT
FILED: JUNE 23, 2003)
TITLE: PROCESS FOR THE PREPARATION)
OF POLYISOCYANATES OF THE)
DIPHENYLMETHANE GROUP)
HAVING A REDUCED COLOR VALUE)

LETTER

Mail Stop - Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 2231-1450

Sir:

Enclosed herewith is an Appeal Brief in the matter of the subject Appeal.
Please charge the fee for filing the Brief, \$500.00, to our Deposit Account Number
13-3848 .

Respectfully submitted

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Date
N. Denise Brown, Reg. No. 36,097
Name of applicant, assignee or Registered Representative
N. Denise Brown
Signature
November 3, 2005
Date



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VALUE)

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This Brief is an appeal from the Final Office Action of the Examiner dated June 10, 2005, in which the rejection of Claims 1, 8-11 and 18-24 was maintained. A Notice of Appeal was filed on September 8, 2005.

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Date
N. Denise Brown, Reg. No. 36,097

Name of applicant, assignee or Registered Representative

N. Denise Brown
Signature

November 3, 2005
Date

I. REAL PARTY IN INTEREST

This application is assigned to Bayer Aktiengesellschaft.

II. RELATED APPEALS AND INTERFERENCES

There is one pending appeal which Appellants are aware of that may be related to, may directly affect, may be affected by or have a bearing on the Board's Decision in this appeal.

This pending appeal is in U.S. Application Serial No. 10/672,440 which was filed in the United States Patent and Trademark Office on September 26, 2003. A Notice of Appeal was filed in this copending application on August 25, 2005 and an Appeal Brief was filed on or before October 25, 2005. The undersigned agent is identifying the pending Appeal in this copending application as the claims therein are directed to a method of producing polyisocyanates of the diphenylmethane series. In the present application, Claims 11, 19 and 20 are also directed to a process for preparing polyisocyanates of the diphenylmethane series.

The method of U.S. Application Serial No. 10/672,440 comprises a) reacting aniline and formaldehyde in the presence of HCl to provide a product mixture containing polyamines of the diphenylmethane series, HCl, aniline and water; b) removing excess aniline and water by distillation to provide a product mixture comprising polyamines of the diphenylmethane series, HCl, no more than 10 wt.% aniline (based on the polyamines) and no more than 5 wt.% water (based on the polyamines); and c) phosgenating the product mixture from b) which comprises polyamines of the diphenylmethane series, HCl, no more than 10 wt.% aniline (based on the polyamines) and no more than 5 wt.% of water (based on the polyamines). This process does not neutralize the acidic HCl catalyst which is used in step a).

III. STATUS OF CLAIMS

The above-referenced application was filed with Claims 1-20.

In an amendment dated March 11, 2005, new Claims 21-24 were presented, and original Claims 2-7 and 12-17 were cancelled.

Claims 1, 9-11 and 19-20 are pending but stand rejected. Claims 1, 9-11 and 19-20 are the subject claims of this appeal.

Claims 8, 18 and 20-24 are allowed.

IV. STATUS OF AMENDMENTS

Appellants filed an amendment after Final Rejection in which they sought to amend Claims 8 and 18 to clarify that an alkaline reaction mixture is formed in step d). In the Advisory Action dated August 25, 2005, the Examiner indicated that the amendment would be entered. The Advisory Action also indicated that Claims 8, 18, and 20-24 were allowed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Of pending claims on appeal, Claim 1 and Claim 11 are both independent claims. Claims 9 and 10 depend directly on Claim 1. Claims 19 and 20 depend directly on Claim 11. Claim 1 is directed to a method for preparing polyamines of the diphenylmethane series, and Claim 11 is directed to a method of preparing polyisocyanates of the diphenylmethane series. Claims 10 and 20, which are argued separately below, depend from Claims 1 and 11, respectively.

The method of Claim 1 for preparing polyamines of the diphenylmethane series comprises a) reacting aniline and formaldehyde in the presence of an acid catalyst to form polyamines, b) neutralizing the reaction mixture from a) with a base, and c) phase separating the neutralized reaction mixture, thereby forming an organic phase comprising polyamines of the diphenylmethane series and an aqueous phase.

(See page 3, lines 6-11; and page 8, lines 12-21.) In step b) the quantity of base exceeds 100% of the stoichiometrically required quantity for neutralization of the reaction mixture. (See page 7, line 31 through page 8, line 2.) The process also requires the addition of at least one alcohol (1) at the beginning of step b), (2) during step b), or (3) after step b) and before step c), with the molar ratio of the alcohol to the formaldehyde being at least 0.02:1. (See page 3, lines 12-17.)

The method of Claim 11 for preparing polyisocyanates of the diphenylmethane series comprises a) reacting aniline and formaldehyde in the presence of an acid catalyst to form polyamines, b) neutralizing the reaction mixture with a base, c) phase separating the neutralized reaction mixture, thereby forming an organic phase comprising polyamines of the diphenylmethane series and an aqueous phase, and d) phosgenating the resultant polyamines into the corresponding polyisocyanates. (See page 3, lines 21-28; page 8, lines 12-21 and page 10, lines 5-7.) The quantity of base in step b) exceeds 100% of the stoichiometrically required quantity for neutralization of the reaction mixture. (See page 7, line 31 through page 8, line 2.) Also, at least one alcohol is added (1) at the beginning of step b), (2) during step b), or (3) after step b) and before step c), with the molar ratio of the alcohol to the formaldehyde being at least 0.02:1. (See page 3, lines 29-30; and page 4, lines 1-3.) This process results in polyisocyanates which have low color values. (See page 2, lines 30-32; page 3, lines 1-4 and page 10, lines 21-22.)

Claim 10 depends on Claim 1 and thus, is also directed to a method for preparing polyamines of the diphenylmethane series. Claim 10 further defines the alcohol required by Claim 1 as being methanol, ethanol, n-propanol, isopropanol, monoethanolamine, N-substituted derivatives of monoethanolamine, diethanolamine, N-substituted derivatives of diethanolamine, triethanolamine, or a mixture thereof. (See page 6, lines 18-30 and page 7, lines 1-3.)

Claim 20 depends directly on Claim 11. Thus, Claim 20 is also directed to a method for preparing polyisocyanates of the diphenylmethane series. The alcohol component is further defined by Claim 20 as being methanol, ethanol, n-propanol, isopropanol, monoethanolamine, N-substituted derivatives of monoethanolamine,

diethanolamine, N-substituted derivatives of diethanolamine, triethanolamine, or a mixture thereof. (See page 6, lines 18-30 and page 7, lines 1-3.)

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, 9-11, 19 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Adkins et al reference (U.S. Patent 5,312,971).

VII. ARGUMENTS

CLAIMS 1, 9, 11 AND 19 ARE NOT RENDERED OBVIOUS UNDER 35 U.S.C. § 103(a) BY THE ADKINS ET AL REFERENCE (U.S. PATENT 5,312,971).

Appellants respectfully submit that the Adkins et al reference does not render the presently claimed invention obvious to one of ordinary skill in the art.

The Adkins et al reference, like presently claimed invention, discloses the preparation of polyisocyanates of the diphenylmethane series from the corresponding polyamines. See column 1, lines 37-40 and 46-54 and column 1, line 63 through column 2, line 2. The present invention, however, requires the addition of an alcohol to the process of preparing the polyamines at one of three points. The alcohol can be added (1) at the beginning of step b) (i.e. before neutralization of the reaction mixture), (2) during step b) (i.e. during neutralization), or (3) after step b) and before step c) (i.e. after neutralization is completed but before the beginning of phase separation). Appellants have found that the addition of an alcohol as specified by the present claim language yields a color improvement in the resultant polyisocyanates. See page 2, line 30 through page 3, line 4; page 4, lines 10-14 and page 10, lines 21-22 of the present specification.

Appellants respectfully submit that the Adkins et al reference does not disclose or suggest adding an alcohol during the preparation of the polyamines. The Adkins et al reference discloses that the addition of a small amount of a reducing agent to polyamines results in a significant reduction in the color of the corresponding

polyisocyanates which are prepared by phosgenating the polyamines. See column 1, lines 34-37. This reference further discloses that the reducing agents are effective in reducing the color of the polyisocyanates if they are added at any time following the addition of the neutralizing agent and before the stripping of the solvent which was used for phosgenation (column 1, lines 54-59). These reducing agents are described as most effective when they are added just before phosgenation of the polyamines. Suitable reducing agents are disclosed in the Adkins et al reference at column 2, lines 4-13. These include boron hydrides, boron halides, metal hydrides, alkali metal alkoxides and hindered phenols. The only specific hindered phenol disclosed is 2,6-di-tert-butyl-4-methylphenol (column 2, line 11).

It is also disclosed by the Adkins et al reference that when a highly reactive reducing agent is added to the polyamines prior to phosgenation, it may be necessary to quench the mixture. This can be done with any relatively low molecular weight monohydroxyl compound, provided that the quenching material is strippable from the mixture. Preferred are monoalcohols having low molecular weights, and most preferably methanol. See column 2, lines 22-29.

Appellants respectfully submit that this disclosure of low molecular weight monohydroxyl compounds, including methanol, as suitable quenching materials to the mixture of polyamines which contains the reducing agent as required by the Adkins et al reference does not lead one of ordinary skill in the art to conclude or reasonably expect that a low molecular weight monohydroxyl compound such as methanol alone could be effective when added to polyamines in reducing the color value of the resulting polyisocyanates. It is readily apparent from the disclosure of this reference that it is the reducing agents which are disclosed and described as effective in reducing the color of the resultant polyisocyanates. This reference does not disclose or suggest that the low molecular weight monohydroxyl compounds such as methanol can effectively decrease the color of the resulting polyisocyanates.

The working examples of the Adkins et al reference also do not disclose or suggest this to one of ordinary skill in the art. In fact, the skilled artisan would not expect the addition of a monohydroxyl compound or monoalcohol to be effective in reducing the color of the resultant polyisocyanates after reading the working examples of this reference.

Examples 1 and 2 of the Adkins et al reference use 1M-borane-tetrahydrofuran complex as the reducing agent (see column 2, lines 59-61 and column 3, lines 30-33). A methanol quench for the reaction solution is used in both examples after the reducing agent was added (see column 2, lines 63-65 and column 3, lines 33-34). Then, the resultant polyamines were phosgenated to form the resultant polyisocyanates, and the color of these polyisocyanates were measured at both 430 nm and 520 nm absorption. These values were compared to those for PMDI prepared in the same manner except with no reducing agent. The results are set forth at column 3, lines 11-16 for Example 1 and at column 3, lines 45-50 for Example 2. Examples 1 and 2 were repeated again, except a methanol quench was not used (see column 3, lines 17-18 and column 3, lines 51-52). These absorptions at 430 nm and 520 nm were compared to those for the polyisocyanates prepared without a reducing agent.

By comparing these values, it is readily apparent that in both Examples 1 and 2 the greatest decrease in the color reduction resulted when only a reducing agent (i.e. 1M-borane-tetrahydrofuran complex) was used. In Example 1, the combination of a reducing agent and methanol quench resulted in a 75% decrease in color at 430 nm and a 86% decrease in color at 520 nm (column 3, lines 11-16). When only a reducing agent was used (with no methanol quench), Example 1 resulted in a 79% decrease in color at 430 nm and a 91% decrease in color at 520 nm (column 3, lines 17-23).

Similarly, in Example 2, the combination of a reducing agent and methanol quench resulted in a 80% decrease in color at 430 nm and a 90% decrease in color at 520 nm (column 3, lines 45-50). When only a reducing agent was used (with no methanol quench), Example 1 resulted in a 86% decrease in color at 430 nm and a 92% decrease in color at 520 nm (column 3, lines 51-57).

Appellants therefore submit that these examples lead one of ordinary skill in the art would to believe that the low molecular weight monohydroxyl compound, specifically methanol, has a detrimental effect on color reduction at 430 nm and 520 nm of the resultant polyisocyanates. It is evident that the combination of a reducing agent and a monohydroxyl compound results in smaller decreases in color of the resulting polyisocyanates compared to a reducing agent alone. Thus, the Adkins et al reference does not suggest that the monohydroxyl compound alone is effective in reducing the color of the polyisocyanates.

It is respectfully submitted that the skilled artisan has no reason to expect or believe that a low molecular weight monohydroxyl compound could effectively reduce the color of the resulting polyisocyanates in the absence of the reducing agent required by the Adkins et al reference. Such a conclusion is contrary to the results of Examples 1 and 2 of this reference as they would be understood by one of ordinary skill in the art.

In addition, Appellants respectfully submit that the disclosure of hindered phenols as suitable reducing agents by the Adkins et al reference does not imply or suggest alcohols. Even if one technically considers phenol to be an alcohol, its properties are quite different than the general properties of alcohols. It is submitted by Appellants, that this reference does **not** specifically disclose phenol. Rather, it discloses hindered phenols. The only specific example given is 2,6-di-tert-butyl-4-methylphenol. The structure of 2,6-di-tert-butyl-4-methylphenol is such that a tert-butyl group is attached to each of the carbon atoms of the aromatic ring located on both sides of the carbon atom of the aromatic ring on which the hydroxyl group is attached to. In addition, a methyl group is attached to the carbon atom of the aromatic ring that is directly across (in the para- position) from the carbon atom on which the hydroxyl group is attached to. The tert-butyl groups hinder or "interfere" with the ability of the hydroxyl group to be available for reactions, etc. Thus, Appellants respectfully submit that a hindered phenol as disclosed by the Adkins et al reference would **not** be expected to act or behave in the same manner as a typical low molecular weight alcohol by one of ordinary skill in the art.

Only after reading Appellants' specification does the presently claimed invention become "obvious" to one skilled in the art. Such a perspective does not, however, provide a proper basis for a rejection under 35 U.S.C. § 103(a).

Appellants therefore submit that this rejection is improper and request that it be withdrawn. The allowance of Claims 1, 9, 11 and 19 is respectfully requested.

CLAIMS 10 AND 20 ARE NOT RENDERED OBVIOUS UNDER 35 U.S.C. § 103(a) BY THE ADKINS ET AL REFERENCE (U.S. PATENT 5,312,971).

Appellants respectfully submit that Claims 10 and 20 of the present application are not obvious to one of skill in the art.

Claims 10 and 20 each require that the alcohol be methanol, ethanol, n-propanol, isopropanol, monoethanolamine, N-substituted derivatives of monoethanolamine, diethanolamine, N-substituted derivatives of diethanolamine, triethanolamine, or a mixture thereof. The Adkins et al reference does not disclose that alcohols can be or are effective in reducing the color of the resultant polyisocyanates. Rather, it describes low molecular weight monohydroxyl compounds as suitable materials for quenching the combined polyamines and reducing agent, particularly when a highly reactive reducing agent is used (see column 2, lines 21-33 of the '971 patent).

Appellants respectfully submit that there is no evidence in the Adkins et al reference that these low molecular weight monohydroxyl compounds are effective in lowering the color of polyisocyanates. This reference specifically describes that reducing agents as disclosed at column 2, lines 3-20 are effective in reducing the color of polyisocyanates.

If the low molecular weight monohydroxyl compounds further reduced the color of the polyisocyanates than what the reducing agents alone do, one skilled in the art might at least question whether the monohydroxyl compounds alone were effective in this manner. However, it is evident from the working examples of the Adkins et al reference, that the greatest reduction in color of the polyisocyanates is obtained when the reducing agents are used without a quenching compound (i.e. a low molecular weight monohydroxyl compound).

As discussed above, in Example 1, the combination of a reducing agent and methanol quench resulted in a 75% decrease in color at 430 nm and a 86% decrease in color at 520 nm (column 3, lines 11-16). By comparison, when only a reducing agent was used (with no methanol quench), the polyisocyanate of Example 1 had a 79% decrease in color at 430 nm and a 91% decrease in color at 520 nm (column 3, lines 17-23). Likewise, in Example 2, the combination of a reducing agent and methanol quench resulted in a 80% decrease in color at 430 nm and a 90% decrease in color at 520 nm (column 3, lines 45-50). This decrease in color was greater when only a reducing agent was used (with no methanol quench). Example 1, with only a reducing agent had an 86% decrease in color at 430 nm and a 92% decrease in color at 520 nm (column 3, lines 51-57).

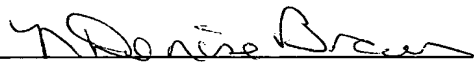
Appellants respectfully submit that this information leads one of ordinary skill in the art to conclude that the low molecular weight monohydroxyl compound (i.e. methanol in Examples 1 and 2) is detrimental in decreasing the color of the polyisocyanates. When both a reducing agent and methanol were used, the color decrease was less than when only a reducing agent was used. Thus, the methanol appears to counteract or interfere with the ability of the reducing agent to reduce the color of the polyisocyanates. It is respectfully submitted that one of ordinary skill in the art could not possibly expect that methanol and other low molecular weight monohydroxyl compounds alone would be effective in reducing the color of polyisocyanates. This is simply not suggested to one of ordinary skill in the art.

Only on hindsight does it become "obvious" to try only the low molecular weight monohydroxyl compound instead of the reducing agent as required by the Adkins et al reference. Such a perspective does not, however, provide a proper basis for a rejection under 35 U.S.C. § 103.

Appellants respectfully submit that the Adkins et al reference does not fairly suggest the invention of Claims 10 and 20 to one of ordinary skill in the art. The allowance of Claims 10 and 20 is respectfully requested.

In view of the preceding arguments, Appellants' respectfully submit that each of the Examiner's rejections is in error and respectfully request that the rejections be reversed. The allowance of Claims 1, 9-11, 19 and 20 is respectfully requested.

Respectfully submitted,

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VIII. CLAIMS APPENDIX:

The following is a listing of the claims on Appeal.

Claim 1. A process for the preparation of polyamines of the diphenylmethane series, comprising

- a) reacting aniline and formaldehyde in the presence of an acid catalyst to form polyamines,
- b) neutralizing the reaction mixture with a base,
and
- c) phase separating the neutralized reaction mixture, thereby forming an organic phase comprising polyamines of the diphenylmethane series and an aqueous phase,

wherein the quantity of base in step b) exceeds 100% of the stoichiometrically required quantity for neutralization of the reaction mixture, and wherein at least one alcohol is added (1) at the beginning of step b), (2) during step b), or (3) after step b) and before step c), with the molar ratio of said alcohol to said formaldehyde being at least 0.02:1.

Claim 9. The process of Claim 1, wherein said base comprises an aqueous sodium hydroxide solution.

Claim 10. The process of Claim 1, wherein said alcohol is selected from the group consisting of: methanol, ethanol, n-propanol, isopropanol, monoethanolamine, N-substituted derivatives of monoethanolamine, diethanolamine, N-substituted derivatives of diethanolamine, triethanolamine, and mixtures thereof.

Claim 11. A process for the preparation of polyisocyanates of the diphenylmethane series comprising

- a) reacting aniline and formaldehyde in the presence of an acid catalyst to form polyamines,

- b) neutralizing the reaction mixture with a base,
- c) phase separating the neutralized reaction mixture, thereby forming an organic phase comprising polyamines of the diphenylmethane series and an aqueous phase,
- and
- d) phosgenating the resultant polyamines into the corresponding polyisocyanates,

wherein the quantity of base in step b) exceeds 100% of the stoichiometrically required quantity for neutralization of the reaction mixture, and wherein at least one alcohol is added (1) at the beginning of step b), (2) during step b), or (3) after step b) and before step c), with the molar ratio of said alcohol to said formaldehyde being at least 0.02:1.

Claim 19. The process of Claim 11, wherein said base comprises an aqueous sodium hydroxide solution.

Claim 20. The process of Claim 11, wherein said alcohol is selected from the group consisting of: methanol, ethanol, n-propanol, isopropanol, monoethanolamine, N-substituted derivatives of monoethanolamine, diethanolamine, N-substituted derivatives of diethanolamine, triethanolamine, and mixtures thereof.

IX. EVIDENCE APPENDIX:

Appellants' have not submitted any evidence.

X. RELATED PROCEEDINGS APPENDIX:

At this time, a decision has not been rendered in the related proceeding which Appellants identified under RELATED APPEALS AND INTERFERENCES. Thus, a copy of the decision is not attached.